

FINAL DRAFT

**WATER QUALITY IMPROVEMENT
STRATEGIES
FOR THE EVERGLADES**

**ALTERNATIVE COMBINATIONS FOR THE
FEEDER CANAL BASIN**

February 27, 2002

**SOUTH FLORIDA WATER MANAGEMENT DISTRICT
West Palm Beach, Florida**

**Please contact Damon Meiers (dmeiers@sfwmd.gov) at 1-800-432-2045 x 6876 with
comments or questions**

INTRODUCTION

The Feeder Canal Basin is an area of approximately 113 square miles located in Hendry County. A map of the Basin is presented in *Figure 1*. The canals and structures within this Basin provide flood protection and drainage in addition to conveying excess runoff to Water Conservation Area 3A (WCA 3A) for water supply and environmental use. The two major canals associated with the Feeder Canal Basin are the North Feeder Canal, and the West Feeder Canal. These two canals merge in the lower southeastern corner of the basin and discharge south through the S-190 structure and into the L-28 Interceptor Canal. The L-28 Interceptor Canal, the West Feeder Canal and the North Feeder Canal are located west of L-28 and provide drainage for the western portion of the Big Cypress Seminole Indian Reservation, plus privately owned agricultural land lying north and west of the Reservation. The southeast terminus of the L-28 Interceptor Canal levee eventually joins the southern extreme of the L-28 levee adjacent to the WCA 3A. A 100 foot earthen plug in the L-28 Interceptor Canal prevents the surface water in L-28 and L-28 Interceptor Canal from mixing. Two secondary canals also exist in the Feeder Canal Basin. They are located upstream of the West Feeder Canal. The Lard Can Canal runs north to south and joins the Wingate Mill Canal which flows west to east at the southern boundary of the Basin. This flow moves southeast to the 280 foot wide West Weir and into the West Feeder Canal which bisects the western side of the Seminole Big Cypress Reservation terminating at the North Feeder Canal. The primary discharge structure in this basin is the S-190 gated spillway about 1/3 mile south of this North and West Feeder juncture. The northwest section of the Seminole Big Cypress Indian Reservation (17,500 acres) comprises nearly 25% of this Feeder Canal Basin.

MAJOR SOURCE CONTROL PROJECT PRESENTLY UNDER CONSTRUCTION:

McDaniel Ranch is a private landowner, whose holding consists of 34.5 sections of land and is the primary contributor of surface water run-off to the North Feeder Canal. It has been a source of some of the highest phosphorus concentrations in surface water flows in the basin. McDaniel Ranch was issued a surface water management Master Permit by the South Florida Water Management District. Construction of the system will be complete by the year 2006 and is expected to meet the 50 ppb phosphorus concentration required by the Seminole Tribe of Florida and McDaniel Landowner's Agreement. The system consists of several detention areas and pre-treatment areas designed to improve surface water quality before discharge off-site. The detention areas are comprised of approximately 6,000 acres and pre-treatment areas consist of approximately 2,000 acres. The expected storage area/volume for the project is at least 6,000 acre-feet.

CENTRAL AND SOUTH FLORIDA RESTORATION CRITICAL PROJECT: The 52,000 acre Big Cypress Seminole Indian Reservation lies directly north of the Big Cypress National Preserve and west of the Water Conservation Area 3A and thus is considered an integral component in the south Florida restoration program. A part of this restoration is the Seminole Tribe Big Cypress Reservation Water Conservation Plan (WCP) designed in two phases. Both phases are funded in part by the USACOE as the largest of the Federal Critical Restoration Projects and authorized by Section 528 of the Water Resources Development Act (WRDA) of 1996.

Phase I is the construction of the East Main Conveyance Canal on the east side of the Seminole Reservation and is scheduled for completion by January 2003. This Project ensures the delivery of the Tribe's established entitlement of water (47,000 acre-feet/year) via the recently constructed S-409 pump station located at the L3/L4 pool known as Confusion Corner within the Big Cypress Seminole Indian Reservation. See *Appendix B* for map of the project.

Phase II of the Conceptual Plan, is designed to improve water quality, wetland restoration and water conveyance capacity in this basin by enhancing existing wetlands through re-hydration, transitioning existing poor quality uplands to functioning wetland habitat and establishing water detention cells as flood control. The completion date for Phase II is scheduled for September 2005.

The Big Cypress Seminole Indian Reservation's total land area is approximately 52,000 acres. However, within the *entire* Water Conservation System Project Area only the western sub-basins, or 10,090 acres are included in the Feeder Canal Basin. Of this amount 7,998 are contributing drainage areas and 2,092 are treatment areas (this number will increase to 2,493 acres when the removal of dikes and ditches is considered). These 'treatment areas' include four (4) Water Resource Areas comprising 1,425 acres, fourteen (14) Irrigation Cells and one (1) Stormwater Attenuation Cell. The expected storage area/volume for the total WCP is 5,270 acre-feet.

Water Resource Areas are designed to hold 1 foot of water for 9 months, Irrigation Cells 3-4 feet of water for 6 months and Stormwater Attenuation Cells at 3 feet dependent upon rainfall. It is expected that the TP concentration removal within these systems will be dependent on the treatment area, depth of water and retention times as estimated but will meet the 50 ppb phosphorus concentration as expressed in the USACOE permit (199800622 IP-SS).

CERP PROJECTS IN FEEDER CANAL BASIN:

The Big Cypress/L-28 Interceptor Modifications Project is scheduled to be completed in June 2015. The Project incorporates both flow diversion and STAs designed to work in conjunction with the Tribe's Water Conservation Plan. Current canal water flows in the West and North Feeder canals upstream from structure S-190 will be modified to surface water sheetflow south across the Big Cypress National Preserve (BCNP), downstream of the Seminole Tribe's Big Cypress Indian Reservation, using three (3) pump stations (WRA-1 @250 cfs, WRA-2 @ 500 cfs and WRA-3 @750 cfs) and a spreader canal system. Additionally, S-190 would be converted from a gated structure to a pump station to maintain upstream flood protection. After conversion to a pump station of 1460 cfs from its existing 2960 cfs, the S-190 will push flows south into the L-28 Interceptor Canal (the western boundary of the L-28 Basin) where sheetflow will also be re-established with the backfilling and degradation of the southwest L-28 Interceptor Canal levee. Mullet Slough, located south of the Feeder Canal Basin, is expected to influence the direction of this sheetflow to the southeast and eventually into the WCA 3A. Decreases of pollutant loading are expected to the western portion of WCA-3A and the downstream Everglades

National Park from a reduction of the 31 year average flow of 89,300 acre-feet/year directly to the WCA-3A to the 2050 base condition of overland sheetflow only.

Additionally, two STAs would be constructed adjacent to the West and North Feeder Canals to treat storm water runoff from upstream basins prior to entering the Seminole Tribe's North Feeder Canal. These two STAs, an 1,100 acre STA adjacent to the North Feeder Canal (4,400 acre-feet storage volume) and an 800 acre STA adjacent to the West Feeder Canal (3,200 acre-feet storage volume) are sized to reduce TP and other pollutant loads to the BCNP, the Miccosukee Tribe Reservation and ultimately WCA-3A, to assure compliance with applicable water quality standards in the receiving waterbodies.

Historic flow and water quality data from the S-190 pump structure were compiled to generate the Baseline data set (DBKEY 15987). The simulated flow and phosphorus data for this structure for the 31-year period (1965-1995) are presented in *Figure 2*.

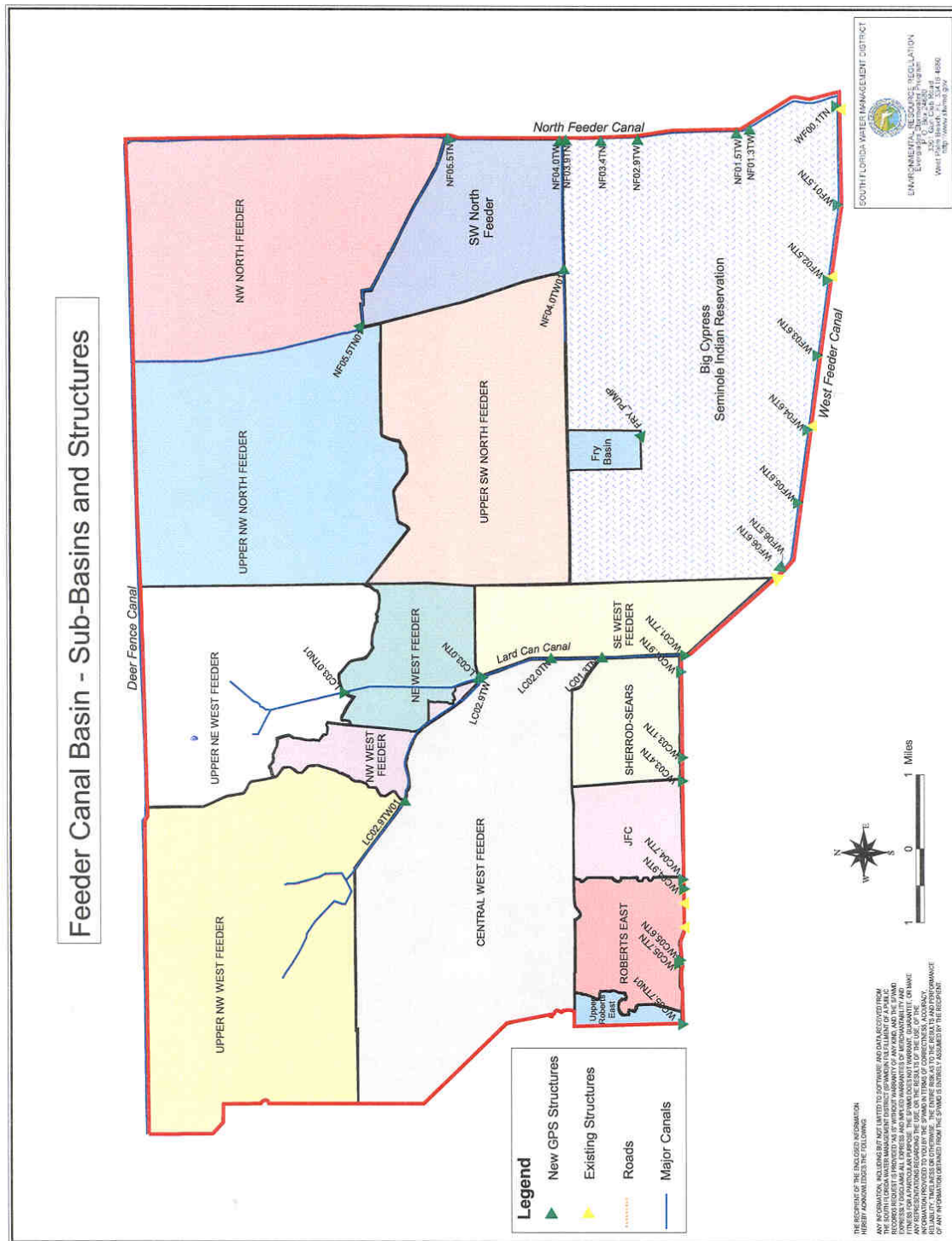
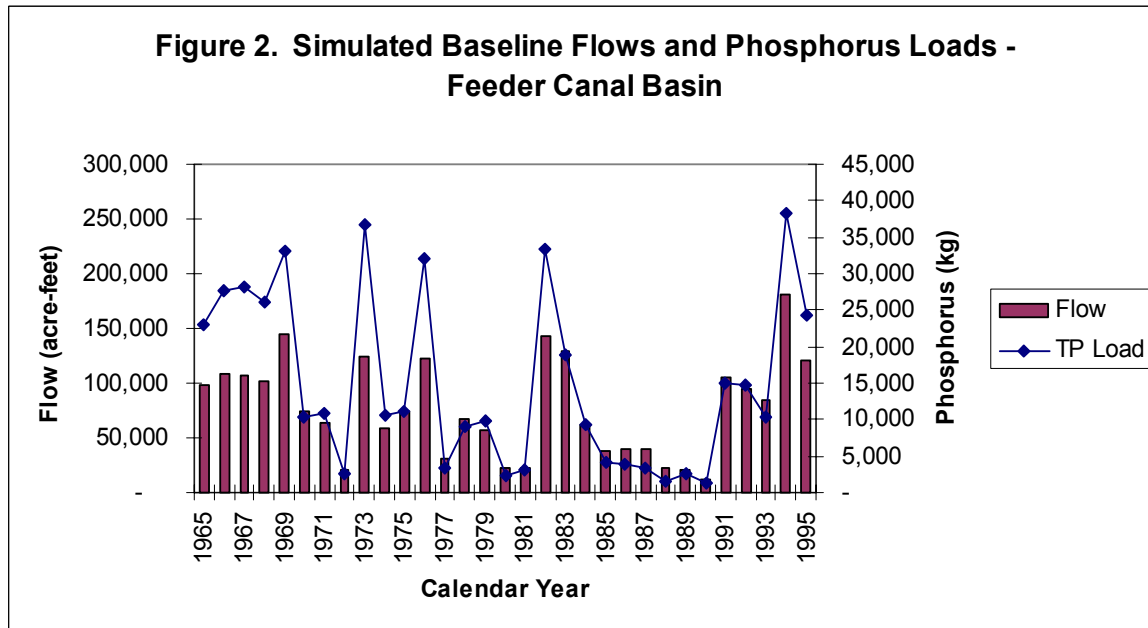


Figure 1. Feeder Canal Basin



*Note: Baseline Flows and Phosphorus Loads shown in *Figure 2* are comprised of simulated flows from the South Florida Water Management Model (SFWMM) and observed water quality data from the ten-year period WY 90-99. To develop the baseline flows, the SFWMM was used to simulate current operational conditions and utilized rainfall for the 31-year period between January 1, 1965 and December 31, 1995. The goal was not to recreate the 31-year period of record flows, but rather, to simulate the expected hydrologic response in the basin as a result of the 31-year rainfall history. For the water quality component, a regression relationship was developed between flow and phosphorus concentration. The resulting regression equation was applied to the simulated flows to create the 31-year period of Baseline flow and water quality data. Reference: *Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-term Water Quality Goals for the Everglades, SFWMD, May 2001.*

The summary of the 31-year period of Baseline data at S-190 yields average annual simulated flows of 77,179 acre-feet and TP loads of 14.854 metric tons. The flow-weighted mean TP concentration is 156 ppb.

ALTERNATIVES FOR FEEDER CANAL BASIN

Alternative combinations of source control and STAs for the Feeder Canal Basin are presented below. Major components of the alternatives, along with probable influences on the flows and water quality of discharges to Water Conservation Area 3A, are briefly described.

It should be noted that the alternative combinations below assume implementation of source controls (Agricultural Best Management Practices (BMPs)) by December 2006. It is assumed all alternatives will maintain existing levels of flood protection within the basin.

Alternative 1

- Source Control Component: Agricultural BMPs and applicable Permit Enforcement by December 2006.
- STA Component by December 2006.

Alternative 2

- Source Control Component: Agricultural BMPs and applicable Permit Enforcement by December 2006.

Note: Separable costs will be provided for previously purchased land(s) which are to be incorporated in alternatives.

Alternative 1 – Implement Source Control Component by 2006 and STA Component by 2006**Description:**

- A. Source Control:** It is assumed that agricultural stormwater BMPs, as defined by the Everglades Stormwater Program (or on Indian Lands under the authority of the EPA) along with enforcement of any applicable permit conditions will be implemented in the Feeder Canal Basin by December 2006.
- B. STA Component:** This alternative involves construction of an STA in the Feeder Canal Basin to treat stormwater flows prior to discharge WCA-3A for the period December 2006 through 2056. The STA will be designed to reduce TP to the lowest sustainable concentration using the optimal combination of emergent, submerged aquatic vegetation (SAV), and PSTA.

Influence on Flow:

- A. Source Control:** It is assumed that there will be no reduction in the Baseline flows associated with source controls.
- B. STA Component:** It is assumed that there will be no reduction in the Baseline flows associated with this component.

Influence on Water Quality:

- A. Source Control:** The Baseline loads will be reduced to reflect 50 ppb discharges from the Feeder Canal Basin as a whole for the full evaluation of this alternative. As part of a sensitivity analysis, the phosphorus loads associated with discharges from the Feeder Canal Basin will be varied to 75 ppb and 100 ppb, and the influence that this variation has on the size of the STA will be calculated and summarized. An additional 50-year present worth cost estimate will be developed for the 75-ppb basin discharge case.
- B. STA Component:** It is assumed the treatment of stormwater runoff in an STA will result in a reduction in total loads of phosphorus to the EPA by December 2006.

Costs:

- A. Source Control:** There will be no cost estimates developed for this component.
- B. STA Component:** Land acquisition, levees, structures, borrow canals, limerock, and additional O & M costs, etc., will be required in order to implement this alternative.

Note: Separable costs will be provided for previously purchased land(s) which are to be incorporated in alternatives.

Alternative 2 – Implement Source Control Component by 2006

Description:

- A. Source Control:** It is assumed that agricultural stormwater BMPs, as defined by the Everglades Stormwater Program (or on Indian Lands under the authority of the EPA) along with enforcement of any applicable permit conditions will be implemented in the Feeder Canal Basin by 2006.

Influence on Flow:

- A. Source Control:** It is assumed that there will be no reduction in the Baseline flows associated with source controls.

Influence on Water Quality:

- A. Source Control:** The Baseline loads will be reduced to reflect 50 ppb discharges from the Feeder Canal Basin as a whole for the full evaluation of this alternative. As part of a sensitivity analysis, the phosphorus loads associated with discharges from the Feeder Canal Basin (from the Baseline data set) will be varied to 75 ppb and 100 ppb, and the influence that this variation has on the loads to the EPA will be calculated and summarized.

Costs:

- A. Source Control:** There will be no cost estimates developed for this component.

APPENDIX A

BACK UP, CALCULATIONS, AND ASSUMPTIONS

ADDITIONAL BACKGROUND INFORMATION

Source Control Component

Basin-wide Source Controls. Source controls will require the implementation of a comprehensive and basin-wide pollution prevention plan. The plan must include regulation promulgation, hiring and equipping maintenance personnel, infrastructure improvements, and hiring compliance and enforcement staff. These basin-wide source controls will consist of Agricultural BMPs and Regulatory Programs as applicable to the landholders.

Agricultural Best Management Practices are stormwater management practices for agricultural areas. Examples include flow diversion, detention and/or retention, farming practices such as cover crops, buffer strips, etc., animal discharge controls, canal maintenance control and preventative maintenance programs.

Regulatory Programs (Permits and Permit Modifications) are developed to improve water quality, including identifying structures or systems requiring permits or modifications to permits. Regulatory programs may include any combination of voluntary BMPs, requirement and/or modification of permits, construction projects and basin-specific regulatory programs to achieve compliance with state water quality standards.

SUPPLEMENTAL DOCUMENTS

- Feeder Canal Basin Water Quality Grab Sampling Survey, 1/28/98. Everglades Regulation Division, Regulation Dept., South Florida Water Management District. Steve Senates, Basin Manager.
- USACOE Permit No: 199800622 (IP-SS). U.S. Army Engineer District, Jacksonville, FL. Permittee: Seminole Tribe of Florida.
- Seminole Tribe Everglades Restoration Initiative: Water Conservation System, Conceptual Plan. Briefing Paper to the U.S. Dept. of Interior. 2/17/95.
- Seminole Tribe of Florida: Conceptual Water Conservation System Design. Prepared by AMS Engineering and Environmental. 2/6/95.
- South Florida Water Management District Permit #26-00623-P: McDaniel Ranch

APPENDIX B

